Int Urogynecol J (2011) 22:1197–1198
DOI 10.1007/s00192-011-1397-0

LETTER TO THE EDITOR

Misconception of the Valsalva maneuver

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Received: 27 October 2010 / Accepted: 21 February 2011 / Published online: 9 April 2011

Dear Editor,

In urogynecology, we notice a lack of scientific data regarding breathing-dependent synergies between diaphragm and pelvic floor muscles, and associated changes in intra-abdominal and intrathoracic pressure distribution. In particular, the Valsalva maneuver, which is often applied to support urine or stool evacuation and to evaluate stress resistance of the urethra during urodynamic, ultrasound, and MRI studies is insufficiently defined. Sometimes it is even equated with an abdominal straining maneuver [1]. However, the two maneuvers reflect opposite respiratory patterns associated with different pelvic floor positions and differential pelvic floor muscle contractile status.

The Valsalva maneuver is named after the Italian physician and anatomist Antonio Maria Valsalva (1666–1723). His principal scientific interest was the human ear. He advised forceful expiration against closed nostrils and mouth in order to increase intrathoracic pressure that is transmitted through the open glottis to the oronasopharyngeal cavity, and thus opens Eustachian tubes and inflates the middle ear. During expiration, abdominal and pelvic floor muscles contract together in order to increase intra-abdominal pressure and to push the diaphragm upwards (Fig. 1a) [2]. Prolonged increase in

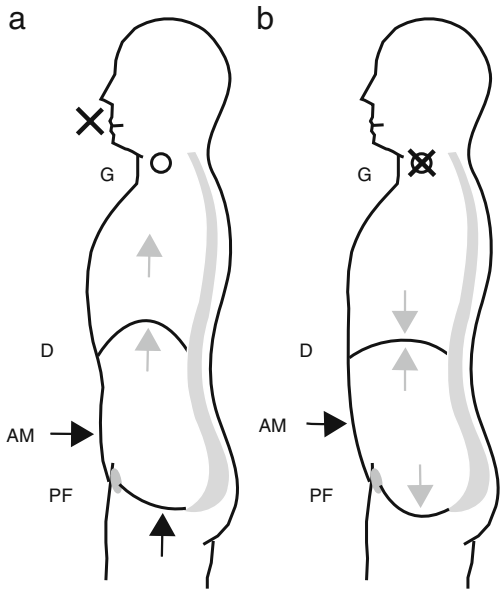

Fig. 1 Theoretical model indicating movements of the diaphragm, the abdominal wall and the pelvic floor, as well as pressure distributions in the abdominal and thoracic cavity—during forced expiration, as it occurs when performing a Valsalva maneuver (**a**), and during inspiration, which precedes an abdominal straining maneuver (**b**). *G* glottis, *D* diaphragm, *PF* pelvic floor, *AM* abdominal wall muscles. *Black arrows* indicate active muscle contraction. *Grey arrows* indicate intra-abdominal and intrathoracic pressure distribution. *Black cross* indicates closure of mouth and nostrils during a Valsalva maneuver (**a**) or closure of the glottis during straining (**b**). **a** Valsalva maneuver. During forced expiration, pelvic floor and abdominal wall muscles contract. The relaxing diaphragm is forced upwards by the rising intra-abdominal pressure. Subsequently, also intrathoracic pressure rises by the reduction in intrathoracic volume and is transmitted through the open glottis to the oronasopharyngeal cavity. **b** Abdominal straining maneuver. Inspiration starts with a contraction and downward movement of the diaphragm into the abdominal cavity. Pelvic floor muscles relax. In this situation, abdominal wall muscles contract to increase intra-abdominal pressure which may initiate, maintain, or improve urinary stream or defecation. In order to avoid simultaneous cranial displacement of the diaphragm and to maintain intrathoracic counter-pressure, the glottis closes at the beginning of the straining maneuver

Comment to the International Urogynecological Association/ International Continence Society joint report on the terminology for female pelvic floor dysfunction (January 2010; doi:10.1007/s00192-009-0976-9

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intra-abdominal and intrathoracic pressure, as it occurs with maximal activation of expiratory muscles during the Valsalva maneuver, reduces venous blood flow to the heart and evokes a vagal reflex. It has therefore been applied in internal medicine to arrest episodes of paroxysmal supraventricular tachycardia. But over the years, a misconception of the Valsalva maneuver has crept in, as it became confused with abdominal straining. Many authors recommended forceful expiration *against a closed glottis*, which in fact contradicts the main purpose of the original maneuver. Not only does a closed glottis hamper pressure transmission towards the Eustachian tube, but glottal closure is an essential aspect of "abdominal straining", which reflects an inspiratory pattern: the diaphragm contracts and flattens downwards into the abdominal cavity; the glottis closes in order to maintain intrathoracic counter-pressure and to impede upwards displacement of the diaphragm into the thoracic chest; abdominal wall muscles contract to increase intra-abdominal pressure against relaxed pelvic floor muscles (Fig. 1b).

Both Valsalva and abdominal straining maneuvers lead to increased intra-abdominal and intrathoracic pressure, but during the Valsalva maneuver, pelvic floor muscle contraction prevents descent of pelvic organs by elevation of the pelvic floor and inhibits urine leakage by circular contraction and closing of vagina and urethra. During straining, however, pelvic floor muscles are eccentrically contracted and relaxed in order to initiate, maintain, or improve voiding and defecation. We therefore commend strict differentiation between the two maneuvers. Clinicians and scientists alike must be aware of the condition they want to investigate, and patients must be diligently instructed to either exhale and contract expiratory muscles, including pelvic floor muscles, or to inhale and close the glottis and to strain towards relaxed pelvic floor muscles. Confusing Valsalva and abdominal straining maneuvers may adversely affect study results and may hamper techniques of pelvic floor muscle reeducation.

References

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